Remarks:

Reconsideration of the application, as amended herein, is respectfully requested.

Claims 24 - 44 are presently pending in the application. Claims 24, 30 and 37 - 43 have been amended. Claims 6, 8, 11 and 13 - 23 were previously canceled. Claims 1 - 5, 7, 9 - 10, 12 and 45 - 46 are being canceled without prejudice, herein, for pursuit in a divisional application to be filed on a later date. As it is believed that the claims were patentable over the cited art in their previously presented form, the claims have not been amended to overcome the references.

Applicants do not believe that the amendments to the claims raise new issues for consideration, nor do they necessitate a new search. In particular, in light of the USPTO Memorandum dated January 7, 2009, entitled "Guidance for Examining Process Claims in view of *In re Bilski*", claims 22 and 37 were amended herein to even more clearly tie the processes of those claims to a machine that performs them. **These amendments are believed not to raise new issues for consideration and not to necessitate a new search, because the concept of performing a method, as claimed, using a processor was already considered during examination of certain of Applicants' independent claims, such as claims 12 and 34.** The amendments to claims 24

and 37 are supported by the specification of the instant application, for example, on page 8 of the instant application, lines 10 - 25.

In item 2 of the above-identified Office Action, claims 1 - 5, 7, 9, 10, 12 and 24 - 46 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over U. S. Patent No. 7,190,840 to Said ("**SAID**") in view of U. S. Patent No. 6,466,698 to Creusere ("**CREUSERE**"). In item 3 of the Office Action, claims 39 - 41 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over **SAID** in view of **CREUSERE**, and further in view of U. S. Patent No. 6,856,701 to Karczewicz et al ("**KARCZEWICZ**").

Applicants respectfully traverse the above rejections.

First, the above-noted rejections of claims 1 - 5, 7, 9 - 10, 12 and 45 - 46 are believed to be moot in view of the cancellation of those claims from the instant application. Applicants reserve the right to argue the patentability of claims 1 - 5, 7, 9 - 10, 12 and 45 - 46 over the cited references when those claims are reintroduced in a divisional application.

Applicants' remaining claims 24 - 44 are also believed to be patentable over the combination of the cited references. More particularly, Applicants' independent claims 24 and 33 - 36 recite, among other limitations:

> a significance map is coded, the significance map **specifying the positions of transform coefficients being unequal to zero** in the block in a scan order in a context-dependent way using contexts depending on the corresponding scan position of **the transform coefficient** considered, and **subsequently**,
>
> in a reverse scan order, **starting with** the last transform coefficient being unequal to zero within the block, **the values (levels) of the transform coefficients being unequal to zero are coded in a context-dependent way** using contexts depending on a number of transform coefficients already coded in the reverse scan order having a magnitude of 1 and a number of transform coefficients already coded in the reverse scan order having a magnitude of greater than 1, respectively. [emphasis added by Applicants]

Independent claims 37 and 38 recite similar limitations, among others. Thus, according to the clear language of Applicants' independent claims, Applicants' claimed invention requires, among other things, **coding the positions of transform coefficients being unequal to zero, first, and subsequently, coding the values (levels) of these same transform coefficients** (i.e., note the antecedent basis "of **the** transform coefficients") **in a particularly recited context-dependent way starting with the last transform coefficient being equal to zero within the block.**

Applicants' invention is neither taught, nor suggested, by the references cited in the Office Action.

More particularly, pages 2 - 3 of the Office Action, alleged, in part:

> Said teaches . . . the positions of significant transform coefficients in the block and subsequently (fig. 2), in a reverse scan order (116 of fig. 1; 322 of fig. 3) - starting with the last significant transform coefficients within the block (col. 5, line 60 - col. 6, line 2) - the values (levels) of the significant transform coefficients are determined (322 of fig. 2, Note assign codebook) and coded (118 of fig. 1); . . ..

Further, page 3 of the Office Action pointed to **CREUSERE** as disclosing a missing element from **SAID**, stating in part:

> However, Creusere teaches coding a significance map (fig. 3) specifying the positions of significant transform coefficients in the block (col. 10, lines 35 - 47).
>
> Taking the teachings of Said and Creusere as a whole, it would have been obvious to one of ordinary skill in the art to modify the coding process (col. 10, lines 35 - 47) of Creusere into the encoder of Said for data movement in video is minimized in both the encoder and decoder and scratch memory requirements are greately reduced.

However, Applicants **respectfully disagree** with the statement made in the Office Action alleging that the **SAID** and **CREUSERE** references "taken as a whole" render obvious Applicants' claimed invention.

As discussed in depth in the Applicants' previously filed response, **SAID** operates by dividing the conventional scanning of a transform coefficient block 210 into three partial scans, namely scans 212, 214 and 216 of **SAID**. See, for example, Fig. 2 of **SAID**. In **SAID**, this division is motivated by the fact that, often, images have a high percentage of clearly horizontal edges or clearly vertical edges. Thus, using the method of **SAID**, within the individual blocks, the transform coefficients tend to be restricted exclusively to one of the partial scans 212, 214, 216, so that the remaining partial scans can be easily coded.

As can be seen from Fig. 3 of **SAID**, in **SAID**, the DC coefficient is coded first (step 312), following which, a symbol is coded to show whether the current coefficient block 210 of **SAID** has any AC coefficient (steps 316, 318). Then, the partial scans 212, 214, 216 of **SAID** are passed through in an order not specified by **SAID**. The passing through of the partial scans 212, 214, 216 of **SAID** is represented by the loop of steps 220 - 226 in Fig. 3 of **SAID**. For each partial scan of **SAID**, the position of the last non-zero coefficient in the respective partial scan is coded in step 320 of **SAID**. Thereafter, the transform coefficients of **SAID** are coded in

reverse scan order from the last non-zero coefficient to the first coefficient in step 322 of **SAID**.

However, in **SAID**, the **only** non-zero transform coefficients having their positions coded are the **last** non-zero transform coefficient in each of each of the partial scans 212, 214, 216 of **SAID**. This can be seen from step 320 of fig. 3 of **SAID**, which step is performed during coding of **each** respective partial scan 212, 214, 216. However, due to the process loop formed by steps 220 to 226 of **SAID**, in **SAID**, the order of coding the positions and values of the last significant transform coefficient of each partial, are:

(1) the position of the last non-zero coefficient in the first partial scan is coded;

(2) the value of the last non-zero coefficient in the first partial scan is coded;

(3) the position of the last non-zero coefficient in the second partial scan is coded;

(4) the value of the last non-zero coefficient in the second partial scan is coded;

(5) the position of the last non-zero coefficient in the third partial scan is coded; and

(6) finally, the value of the last non-zero coefficient in the third partial scan is coded.

However, coding performed in **SAID** differs significantly from that of Applicants' claimed invention. For example, among other things, Applicants' claims require that **first**, the

positions of the transform coefficients being unequal to zero in the block are coded, **and subsequently**, the values (levels) of these same transform coefficients are coded, in reverse scan order. In contrast to Applicants' claimed invention, as can be seen from the foregoing, in **SAID**, the values of the last non-zero coefficients in the respective partial scans, are coded and specified **in the same order as the coding of their positions.**

As stated above, page 2 of the Office Action refers to the "reverse order" mentioned, for example, in block 322 in fig. 3 of **SAID**, as allegedly disclosing Applicants' particularly claimed reverse order coding. Applicants respectfully disagree.

SAID only reverse order in connection with the coding of the transform coefficients **within each partial scan** 212, 214, 216, individually. **SAID** does **not** teach or suggest, among other things, **differentiating between non-zero and zero transforms coefficients within one partial scan.** Rather, **SAID** merely discloses, in step 322, that the coefficients in the **current partial scan are processed/coded by working in reverse order from the last non-zero coefficient to the first coefficient. SAID** does **not** disclose whether the transform coefficients **preceding** the last non-zero coefficient (i.e. the coefficients

from the first coefficient to the penultimate non-zero coefficient) are zero or non-zero.

Thus, **SAID** does **not** disclose the positions of the non-zero coefficients within the part of the current partial scan preceding the last non-zero coefficient. In particular, **SAID** does not teach or suggest **coding a significance mapping, indicating the positions of non-zero coefficients preceding the last non-zero coefficient**, as required by Applicants' claims. **SAID** further does **not** teach or suggest, among other limitations of Applicants' claims, coding a significance mapping for a current partial scan and, subsequently, coding (only) the non-zero coefficients, as required by Applicants' claims.

Further, the **SAID** reference actually teaches a person of ordinary skill in this art **away** from Applicants' claimed invention. As discussed above, block 322 of fig. 3 of **SAID** teaches, among other things, "working in reverse order from from the last non-zero coefficient to the first coefficient". This instruction taught by **SAID** teaches a person of skill in this art that **SAID** codes **every** transform coefficient (i.e., from the last non-zero coefficient to the first coefficient) in a partial scan, independent of whether the respective transform coefficient is zero or non-zero. In other words,

SAID defines the coding to occur in reverse order "to the first coefficient", and **not** "to the first, **non-zero** coefficient". Rather, **SAID** does not teach or suggest making any determination whether the "first coefficient" is zero or not. That **SAID** codes **all** transform coefficients, and not only non-zero transform coefficients, is further shown in Table 1 of col. 3 of **SAID**, which shows the coding ten coefficients, including the coding of the zero value coefficient no. 7.

Further, it should be noted that Applicants' claim limitation reciting a "significance map specifying the positions of transform coefficients being unequal to zero in the block" is not taught or suggested by step 320 of **SAID**, disclosing the coding of the position of the **last** non-zero coefficient in a current partial scan of **SAID**. Rather, Applicants' claims clearly require, among other things, that the significance map:

> (1) specify the **positions** of transform **coefficients** being unequal to zero (i.e., more than the one coefficient coded in step 230 of **SAID**); and
>
> (2) specify the positions of these transform coefficients being unequal to zero **in the scan order**. [emphasis added by Applicants]

An indication of the position of a **single** non-zero coefficient (i.e., the last one) within a **partial** scan, as taught by **SAID**, does **not** provide any information on the position of any other

non-zero coefficient within that partial scan, and especially, not in any scan order.

Further, with regard to claims 24 and 33 - 38, page 4 of the Office Action alleged, in part:

> Said further discloses . . . a significance map is coded (PROCESSING COFFICIENTS [sic] IN SCAN, WORKING IN REVERSE ORDER, considered as mapping, from last non-zero coefficient to the first coefficient, then coding the mapped coefficients (118 of fig. 1)), the significance map specifying the positions of transform coefficients being unequal to zero in the block in a scan order (NONE [sic] ZERO COEFFICIENTS, **col. 3, lines 15-49**) . . .. [emphasis added by Applicants]

Applicants respectfully **disagree** with the allegation made in the Office Action that col. 3 of **SAID**, **lines 15 - 49** discloses a significance map specifying the positions of transform coefficients being unequal to zero. More particularly, Table 1 of **SAID** is included within the portion of col. 3 of **SAID** pointed to in the Office Action. Table 1 of **SAID** clearly shows that the invention of **SAID** is intended to code **each and every** transform coefficient, from the last non-zero coefficient to the first coefficient, without differentiating between zero and non-zero coefficients along the way. This can clearly be seen from the coding of the **zero value** coefficient no. 7 in Table 1 of **SAID**.

Clearly, **SAID** fails to teach or suggest, among other things, coding a significance map specifying the positions of transform coefficients **being unequal to zero** in the block in a scan order, as required by Applicants' claims.

Additionally, among other limitations of Applicants' claims, the **SAID** reference fails to teach or suggest, coding a significance map in a context-dependent way using contexts depending on the corresponding scan position of the transform coefficient considered, as required by Applicants' claims.

More particularly, page 4 of the Office Action also alleged, in part:

> Said further discloses . . . a significance map is coded . . ., in a context-dependent way using contexts depending on the corresponding scan position of the transform coefficient considered (**fig. 3, the context-based coding assigns different codebooks to different distributions, scan position, 214, 212, 216 of fig. 2**) . . . [emphasis added by Applicants]

Applicants respectfully disagree with the above-quoted allegations from page 4 of the Office Action. As can be clearly seen from Table 1 of **SAID**, Said's assignment of a codebook to the coefficients **only** depends on the value of the immediately preceding coefficients. This assignment of codebooks is also described in **SAID**, for example, in col. 3 of **SAID**, lines 15 – 17. See also, for example, coefficient nos.

3 - 5 of Table 1 of **SAID**, which are all assigned to codebook C_1 of **SAID**. This is because, in Table 1 of **SAID**, the immediately preceding coefficients (i.e., coefficient nos. 4 - 6) all have a value of -1 or 1. This is described in col. 3 of **SAID**, lines 26 - 27. Thus, in **SAID**, the assignment of a particular codebook of **SAID** to a particular coefficient of **SAID** is **independent from the coefficient number or scan position of the respective coefficient.** As such, **SAID** also fails to teach or suggest, among other limitations of Applicants' claims, coding a significance map in a context-dependent way **using contexts depending on the corresponding scan position of the transform coefficient considered**

The **SAID** reference also fails to teach or suggest, among other limitations of Applicants' claims, coding transform coefficients being unequal to zero in a context-dependent way using contexts depending on a number of transform coefficients having a magnitude of 1 already coded in reverse scan order. This failure of **SAID** is acknowledged on page 5 of the Office Action. Rather, page 5 of the Office Action points to col. 8 of **CREUSERE**, lines 33 - 35, as allegedly disclosing using a number of transform coefficients already coded in the reverse scan order having a magnitude of 1, stating, in part:

> Taking the teachings of Said and Creusere as a whole, it would have been obvious to one of ordinary skill in the art to modify the process of Creusere into the

> encoder of Said to allow the decoder recognized [sic] the exact transmission order of these bits. Doing so would reduce the computation of the decoding process.

Applicants respectfully disagree.

First, Applicants note that there is no teaching, suggestion or motivation in either of the **SAID** and **CREUSURE** references that would lead a person of ordinary skill in this art to combine them in the manner suggested in the Office Action. Further, contrary to the allegations made on page 5 of the Office Action, the **CREUSURE** reference does **not** teach or suggest, among other limitations of Applicants' claims, using a number of transform coefficients already coded in the reverse scan order having a magnitude of 1.

Rather, **CREUSURE** discloses an efficient embedded image and video compression system using lifted wavelets. See, for example, the Title of **CREUSURE**. As understood by a person of ordinary skill in the art, "wavelets" are the impulse response of the spatial filters used to decompose the image in several subbands. Col. 5 of **CREUSURE**, line 43 to col. 6, line 3, teaches that "lifted wavelets" are a special type of "wavelet". During a wavelet transformation, an image is hierarchically decomposed into images of different spatial frequency content. Fig. 9 of **CREUSURE** shows the wavelet subbands, for example, as mere rectangles of different sizes.

Each subband of Fig. 9 of **CREUSURE** represents an image. That is, the coefficient of a subband in **CREUSURE** still forms a representation of the image in spatial domain. The upper-left rectangle in Fig. 9 of **CREUSURE**, for example, represents a low-frequency version of a low-pan filtered version of the original image. Each of the other rectangles in Fig. 9 of **CREUSURE** represent subbands, which represent a sub-sampled version of the original image filtered with an high-pan filter highlighting edges in a respective direction with the impulse response of the filter representing the "wavelet". Due to the sub-sampling from one level to the next, it is possible to arrange the wavelet coefficients such that they fit into the original picture array of the original image. To this end, **CREUSURE** discloses progressively replacing pixel elements of the stored data array with transform coefficient elements through the lifted transformations. See, for example, col. 3 of **CREUSURE**, lines 18 - 26.

As can be seen from Fig. 5 of **CREUSURE**, as every subband is a spatial domain representation of the original image, each portion of a subband corresponds to sub-portions of the other levels. Due to the sub-sampling, however, the portions corresponding to each other are different in size between different hierarchical levels.

Clearly, wavelet transformation alone does not guarantee compression. However, as shown in Fig. 9 of **CREUSURE**, the increasing frequency of the subbands from level to level causes the coefficients within the subbands to get smaller and smaller from level to level. Resultantly, in **CREUSURE**, an increasing fraction of coefficients are quantized to zero within the subbands when compared from level to level. If the wavelet coefficient at a given scale is zero, then it is more likely that the corresponding wavelet coefficients at finer scales will also be zero. See, for example, col. 7 of **CREUSURE**, lines 51 - 55. Using this principle, a further compression yield can be achieved. Thus, in **CREUSURE**, wavelet transformation coefficients are coded using a special symbol to indicate "zerotree" roots (i.e., an indication that the current wavelet coefficient has descendants which are all zero). See, for example, col. 7 of **CREUSURE**, lines 57 - 61. **CREUSURE** addresses the problems that arise from the arrangement of the coefficients in the image array. Clearly, under such circumstances, it is not easy to address the coefficients in the memory. Thus, **CREUSURE** provides special measures for quickly computing the addresses of wavelet coefficients of interest.

The portion of **CREUSURE** cited in the rejection of claims 24 and 33 - 38 on page 5 of the Office Action merely pertains to

the way wavelet coefficients are coded. More particularly, col. 8 of **CREUSURE**, lines 32 - 35, pointed to in the Office Action, state:

> The dominant pass performs a raster scan within each subband, transmitting the sign (+ or -) if a coefficient's magnitude is greater than the threshold, i.e., it is significant, a ZTR if it is less than the threshold but the root of a zerotree at the coarsest possible scale, or a 0.

Clearly, nothing in the above-quoted portion of **CREUSURE** teaches or suggests, among other limitations of Applicants' claims, making use of a number of transform coefficients already coded in the reverse scan order having a magnitude of 1.

Rather, the sentence pointed to on page 5 of the Office Action merely states that **the sig**n of the coefficient is coded in case the coefficient's magnitude is greater than a certain threshold. However, the portion of **CREUSURE** cited on page 5 of the Office Action says nothing about the threshold. Applicants' believe that is, most likely, **not** 1. In any case, this threshold is subsequently described in col. 8 of **CREUSURE**, lines 39 - 43, as being halved for the next bit plane.

Further still, the portion of **CREUSURE** cited in the Office Action merely discloses the use of a condition, i.e., a

coefficient's magnitude being greater than the threshold. However, **CREUSURE** does not disclose "a number of coefficients" having a magnitude greater than something, as required by Applicants' claims.

From the foregoing, it can be seen that, even in combination, the **SAID** and **CREUSURE** references do **not** teach or suggest all limitations of Applicants' claims.

However, even if all limitations of Applicants' claims were disclosed in the **SAID** and **CREUSURE** references, arguendo, a person of ordinary skill in this art would not combine the teachings of **SAID** and **CREUSURE** in the manner suggested in the Office Action. As set forth above, the principle operation of **SAID**, and the inventive contribution thereof, is the sub-division of the conventional scan of a transform coefficient block into three partial scans (212, 214 and 216 of **SAID**). **SAID** divided the block into partial scans to accomplish a spatial decomposition transformation, such that the transform coefficients above a diagonal portion (212 of **SAID**) represent horizontal edges in the image, whereas the transform coefficients below the diagonal region 212 of **SAID** represent vertical edges. Thus, the invention of **SAID** exploits the discovery that many images, such as texts and schematics, have

many vertical and horizontal lines to restrict the transform coefficients for these lines to only one portion scan portion.

In contrast to **SAID**, as discussed above, **CREUSURE** is not concerned with a spatial decomposition type of transformation. Rather, **CREUSURE** discloses the use of a wavelet transformation, which is a filtering-type transformation in which an image is decomposed into a hierarchical structure of subbands. Thus, the main goal addressed by the invention of **SAID** is not applicable in the field of invention of **CREUSURE**, and vice-versa. For example, the main goal of **CREUSURE** is to provide an efficient way to handle zerotree coding in lifted wavelets or hierarchically arranged wavelet decompositions, as shown in Fig. 9 of **CREUSURE**. However, this main goal of **CREUSURE** is not applicable to, or addressed by, spatial decomposition type transformation, as used in **SAID**. Thus, there would be no teaching, suggestion or motivation in **SAID** or **CREUSURE** to combine those references in the manner suggested in the Office Action. As such, a person of ordinary skill in the art would not combine the **SAID** or **CREUSURE** references, in the manner suggested in the Office Action.

Further, the **SAID** reference cannot permissibly be modified by the **CREUSURE**, or any other reference, in any way that would produce Applicants' claimed invention. As discussed above

above, **SAID** specifically teaches coding **the position** of the **last non-zero coefficient**, and **from that position**, coding **all** coefficients in reverse scan order back to the first coefficient, **independent of their significance** . Thus, **SAID** teaches performing a specific method that is **completely at odds** with Applicants' claimed invention. M.P.E.P. § 2143.01(VI) states, in part:

> **VI. THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE**
>
> If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.

As such, M.P.E.P. § 2143.01(VI) holds that a proposed modification cannot change the principle of operation of a reference. The modification of **SAID** proposed in the Office Action, would **impermissibly change the principle of operation** of **SAID** from coding **all** coefficients in reverse scan order from the position of the last non-zero coefficient, as required in **SAID**, to the contrary operation of coding **only the non-zero** coefficients in reverse scan order, as particularly recited in Applicants' claims. In view of M.P.E.P. § 2143.01(VI) the **SAID** reference **cannot** be modified in the manner suggested in the Office Action, and thus, **SAID** cannot

permissibly be combined with any reference to cause such a change in **SAID**'s principle of operation.

For the foregoing reasons, among others, Applicants' claims are believed to be patentable over the **SAID** and **CREUSERE** references, whether taken alone or in any permissible combination. The **KARCZEWICZ** reference, cited in the Office Action in combination with **SAID** and **CREUSERE** against Applicants' claims 39 - 41, does not cure the above-discussed deficiencies of the **SAID** and **CREUSERE**. For the foregoing reasons, among others, Applicants' claims are believed to be patentable over the **SAID**, **CREUSERE** and **KARCZEWICZ** references, whether taken alone or in combination.

With regard to the rejection of the dependent claims 39 - 41, page 7 of the Office Action stated, in part:

> However, Karczewicz teaches binarizing a magnitude of each transform coefficient into a sequence of bins, determining a context for the first bin of the magnitude of each transform coefficient based on a number of transform coefficients already coded in the reverse scan order having a magnitude of 1, context-adaptively coding the first bins of the transform coefficients using the determined contexts (fig. 7b, Bin to level is mapped, context).

However, Fig. 7b of **KARCZEWICZ**, referenced in the rejection of claims 39 - 41, merely discloses that, in **KARCZEWICZ**, the context assigned to the syntax elements run and level depend

on two parameters, namely **the bin number** ("bin to which level is mapped") **and the previous level** ($Prev_{Level}$).

Applicants respectfully request clarification from the Examiner as to what is meant on page 7 of the Office Action by the reference "Bin to level is mapped, context", in the rejection of claims 39 - 41.

It is accordingly believed that none of the references, whether taken alone or in any combination, teach or suggest the features of claims 24 and 33 - 38. Claims 24 and 33 - 38 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claims 24 or 33.

In view of the foregoing, reconsideration and allowance of claims 24 - 44 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate receiving a telephone call so that, if possible, patentable language can be worked out. In the alternative, the entry of the amendment is requested, as it is believed to place the application in better condition for appeal, without requiring extension of the field of search.

If an extension of time for this paper is required, petition for extension is herewith made.

Please charge any fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner Greenberg Stemer LLP, No. 12-1099.

Respectfully submitted,

/Kerry Pauline Sisselman/
Kerry Pauline Sisselman
Reg. No. 37,237

For Applicants

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Lerner Greenberg Stemer LLP
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101